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(54) **COIL COMPONENT**

(71) Applicant: **SAMSUNG ELECTRO-MECHANICS CO., LTD.**, Suwon-si (KR)

(72) Inventors: **Jae Hun Kim**, Suwon-si (KR); **Byeong Cheol Moon**, Suwon-si (KR)

(73) Assignee: **SAMSUNG ELECTRO-MECHANICS CO., LTD.**, Suwon-si (KR)

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H01F 27/02	(2006.01)
H01F 27/26	(2006.01)

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(58) **Field of Classification Search**

CPC H01F 27/2823

USPC 336/199

See application file for complete search history.

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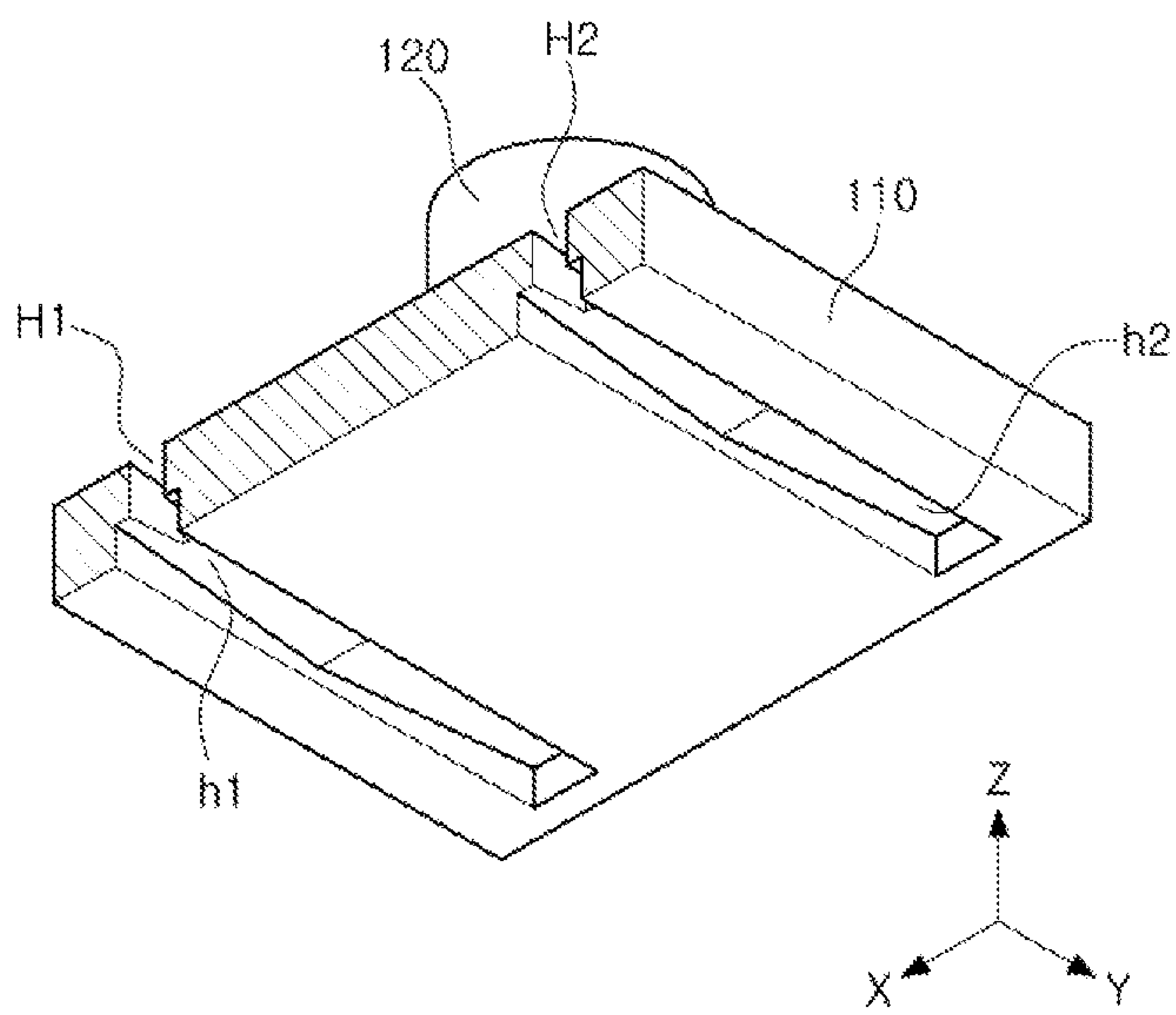
Primary Examiner — Ronald Hinson

(74) *Attorney, Agent, or Firm* — Morgan, Lewis & Bockius LLP

(57) **ABSTRACT**

A coil component includes a mold portion having a first surface and the second surface opposing each other, a winding coil disposed in the second surface of the mold portion, a cover portion disposed on the mold portion and the winding coil, and accommodating grooves on the first surface of the mold portion to be spaced apart from each other, and in which both ends of the winding coil are disposed, the accommodating grooves extend from one side of the mold portion in a width direction, and a minimum distance from the accommodating grooves to the second surface of the mold portion increases or decreased in the width direction.

18 Claims, 9 Drawing Sheets



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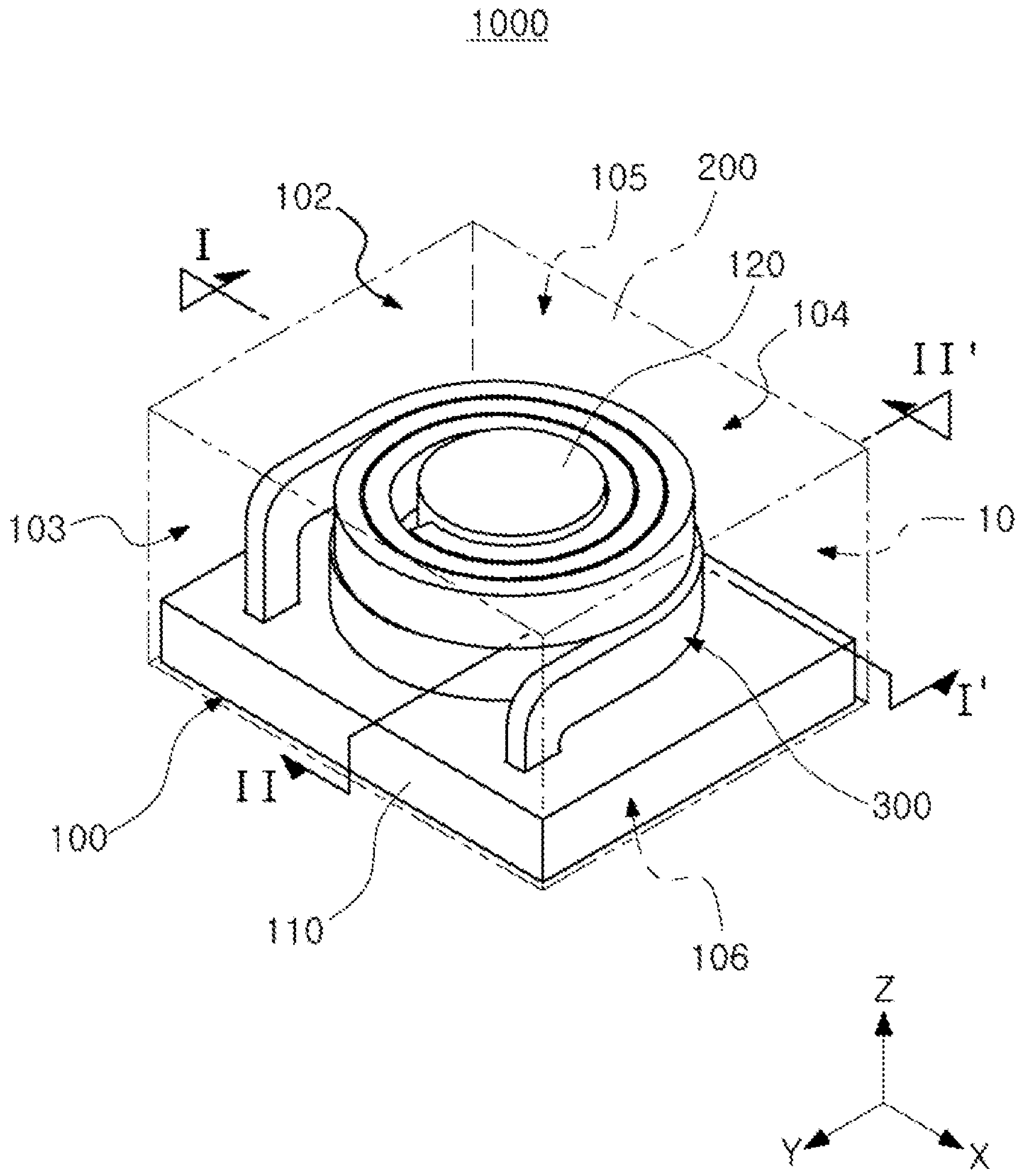

FIG. 1

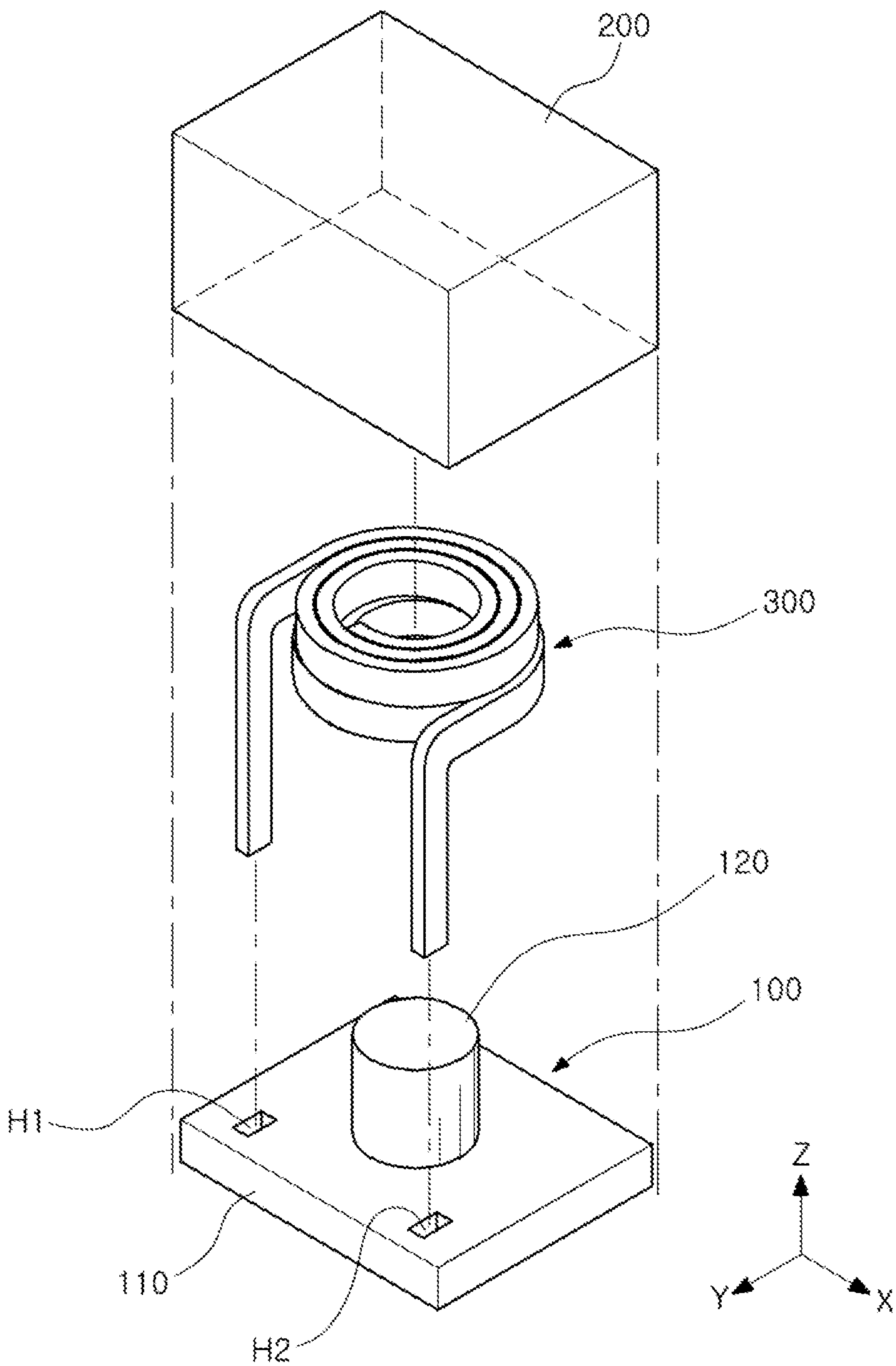

FIG. 2

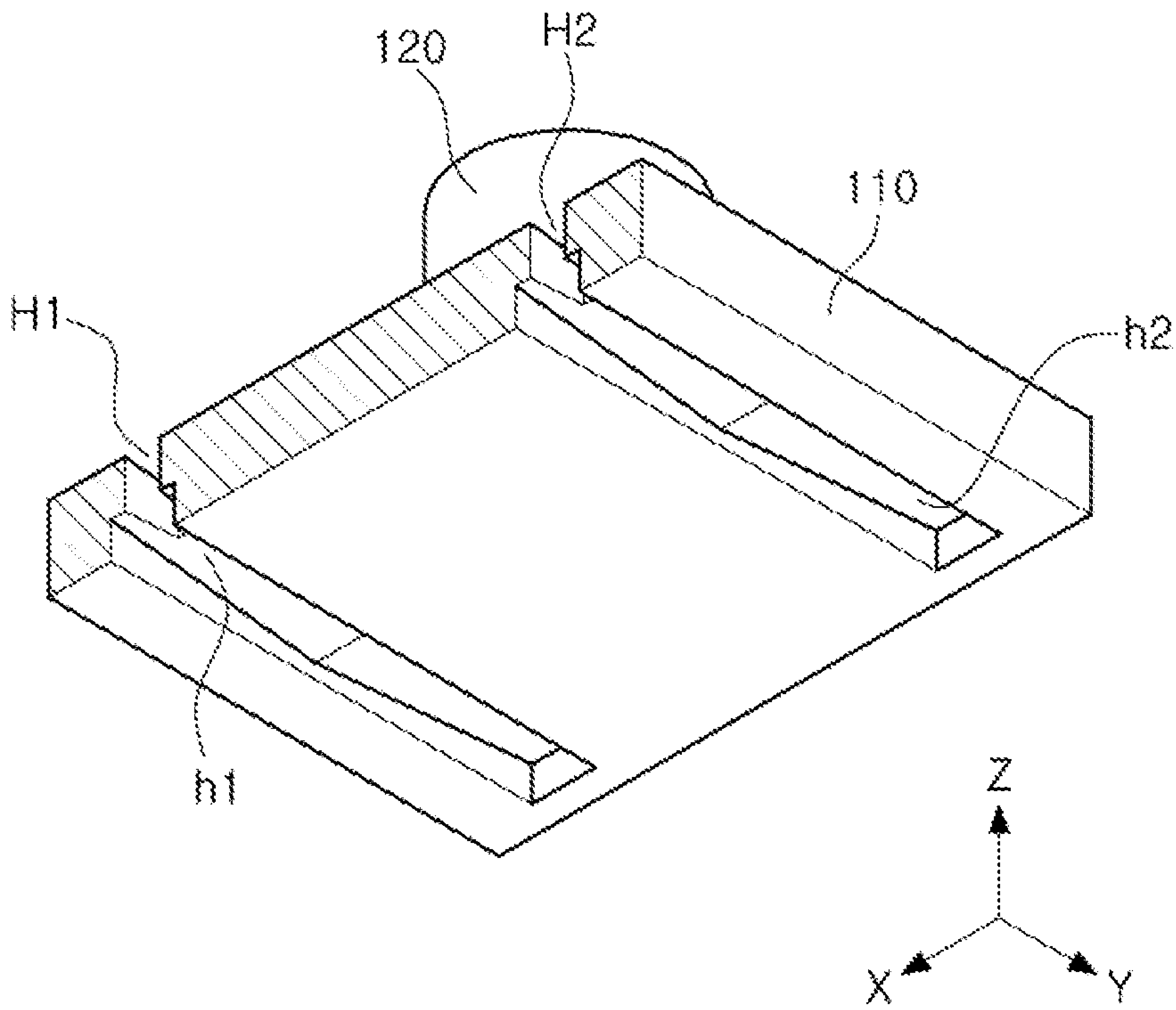

FIG. 3

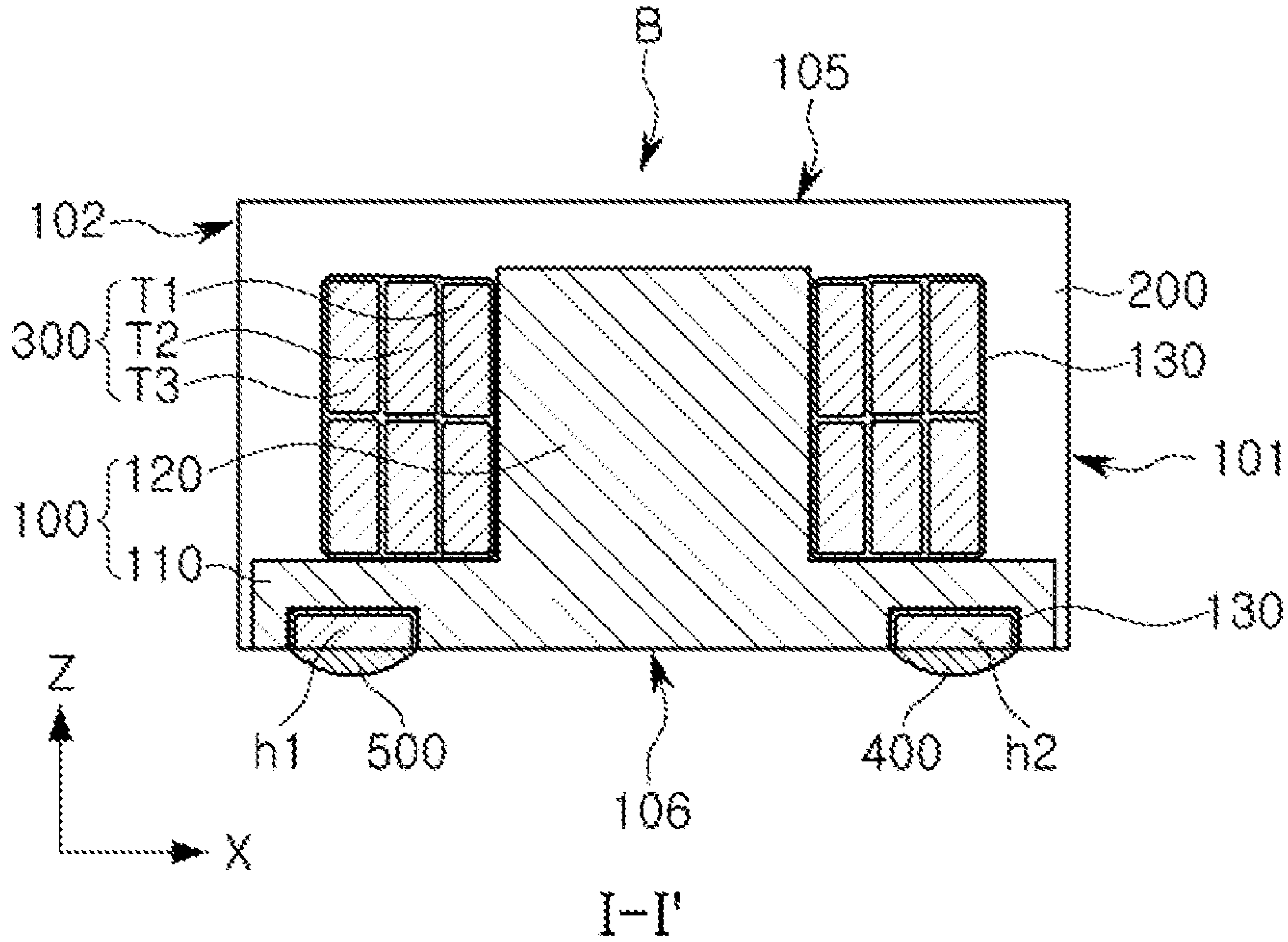
B
105
102
200
T1
T2
T3
300
130
101
120
100
110
130
Z
h1
500
400
h2
106
X
I-I'

FIG. 4

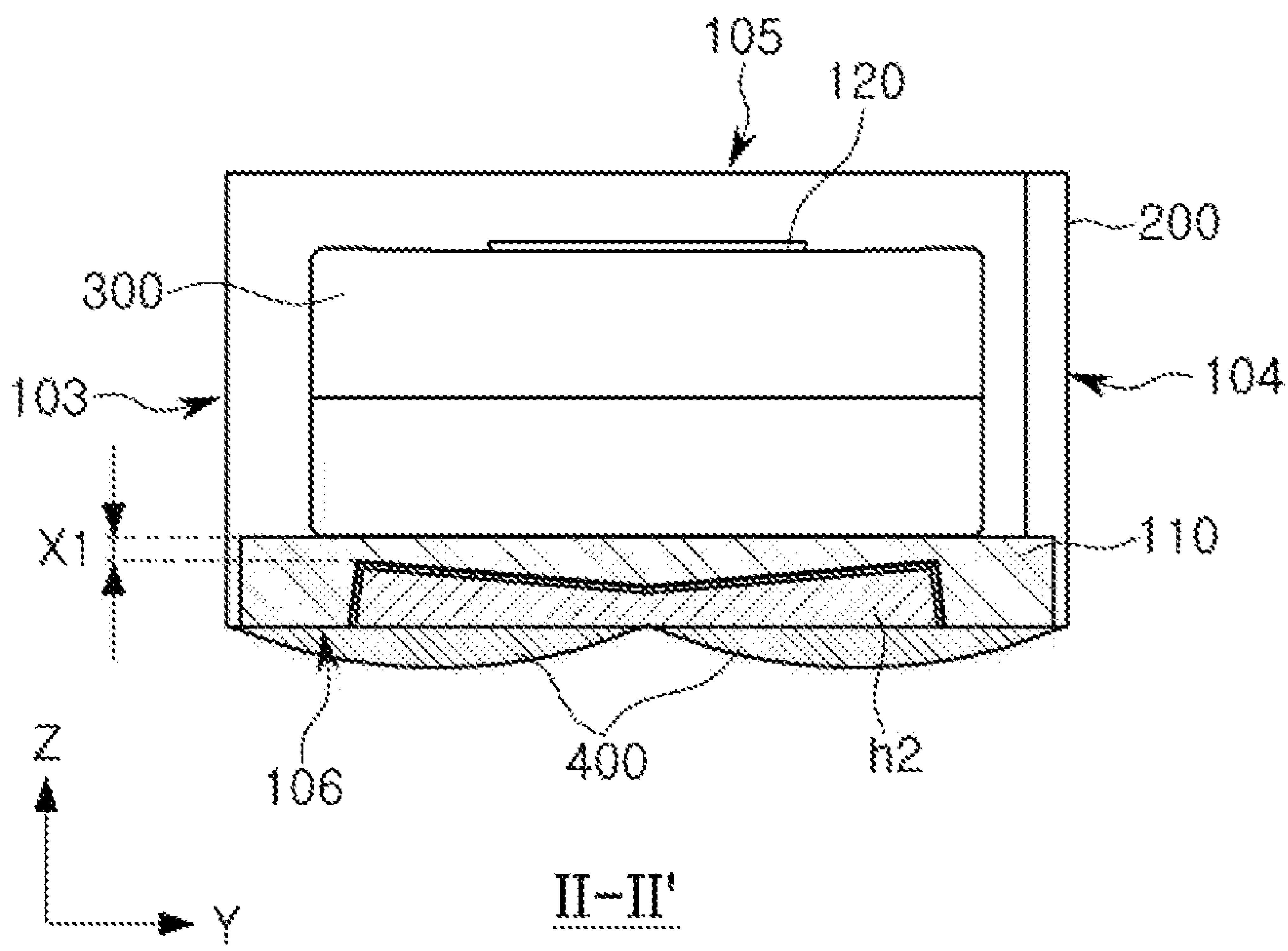

FIG. 5

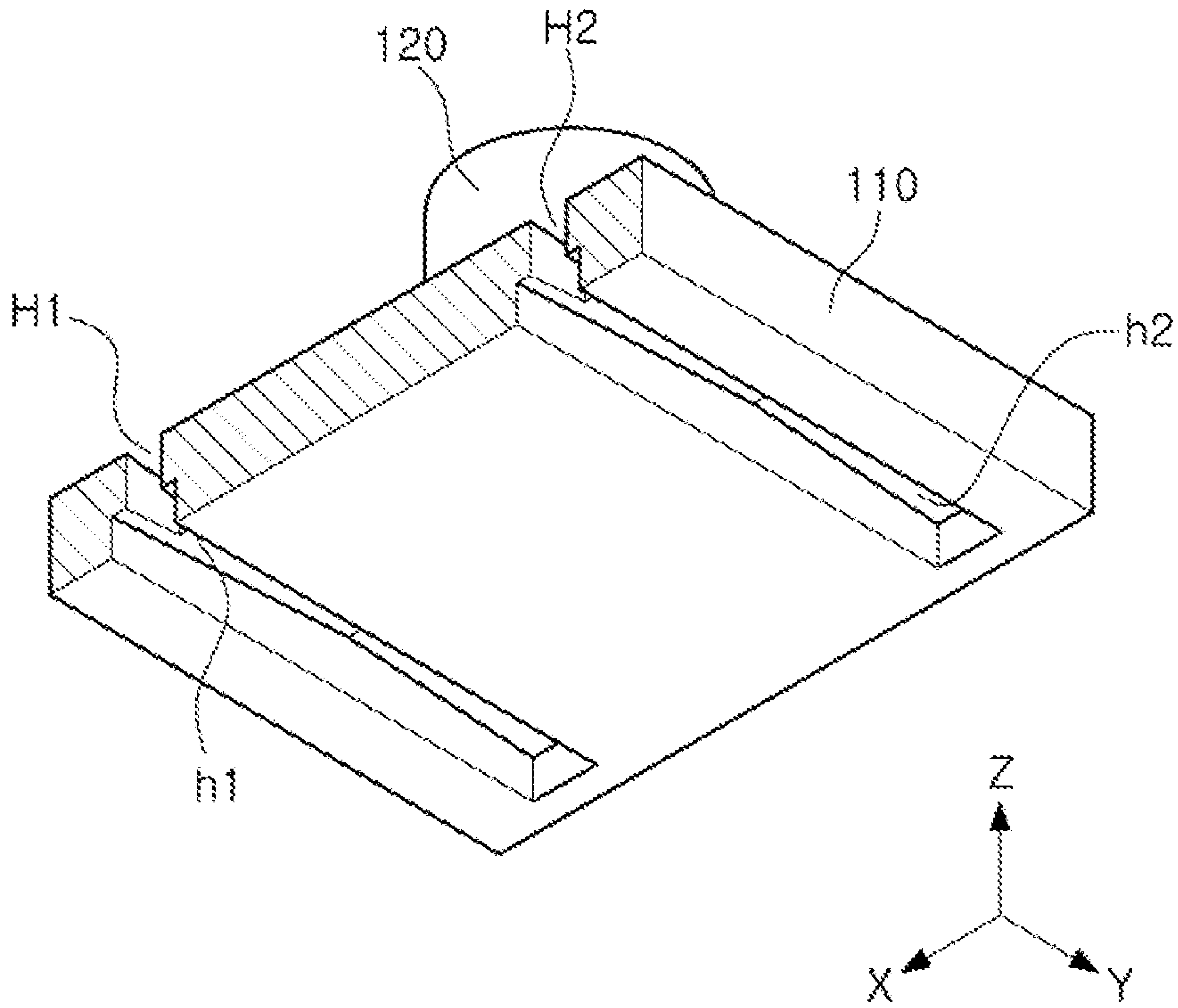

FIG. 6

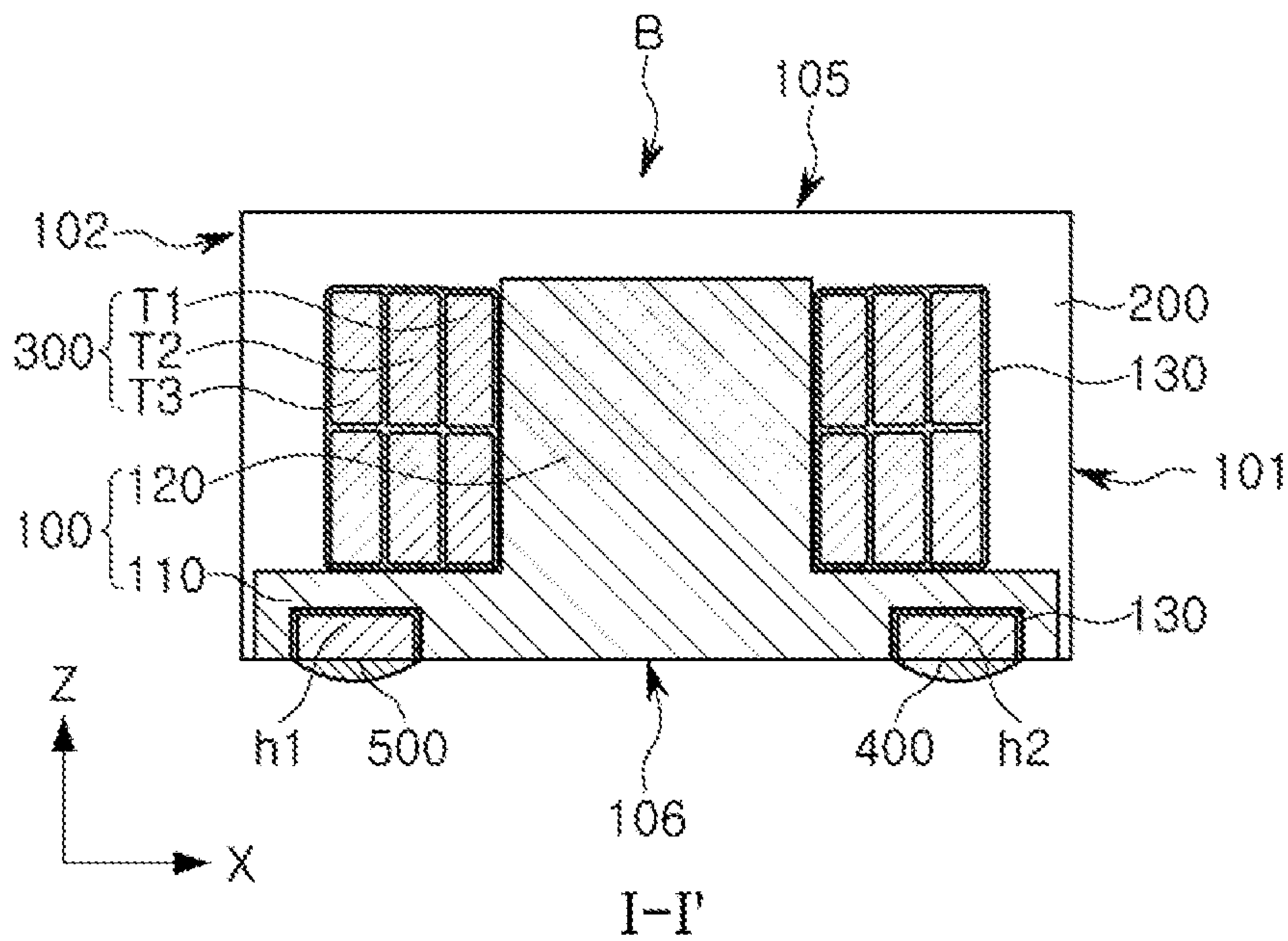
B
105
102
300
T1
T2
T3
200
130
101
100
120
110
130
Z
h1
500
400
h2
106
X
I-I'

FIG. 7

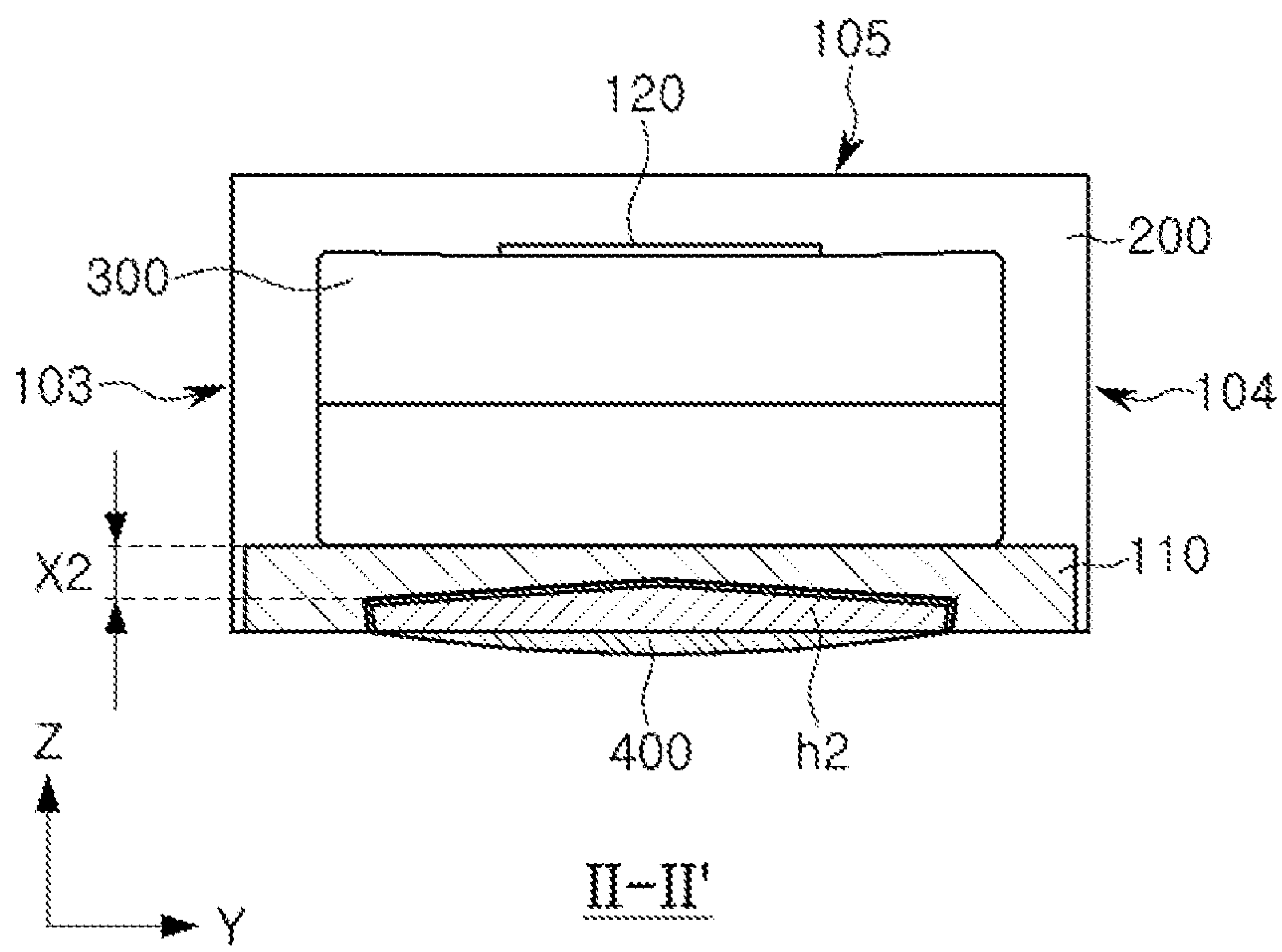

FIG. 8

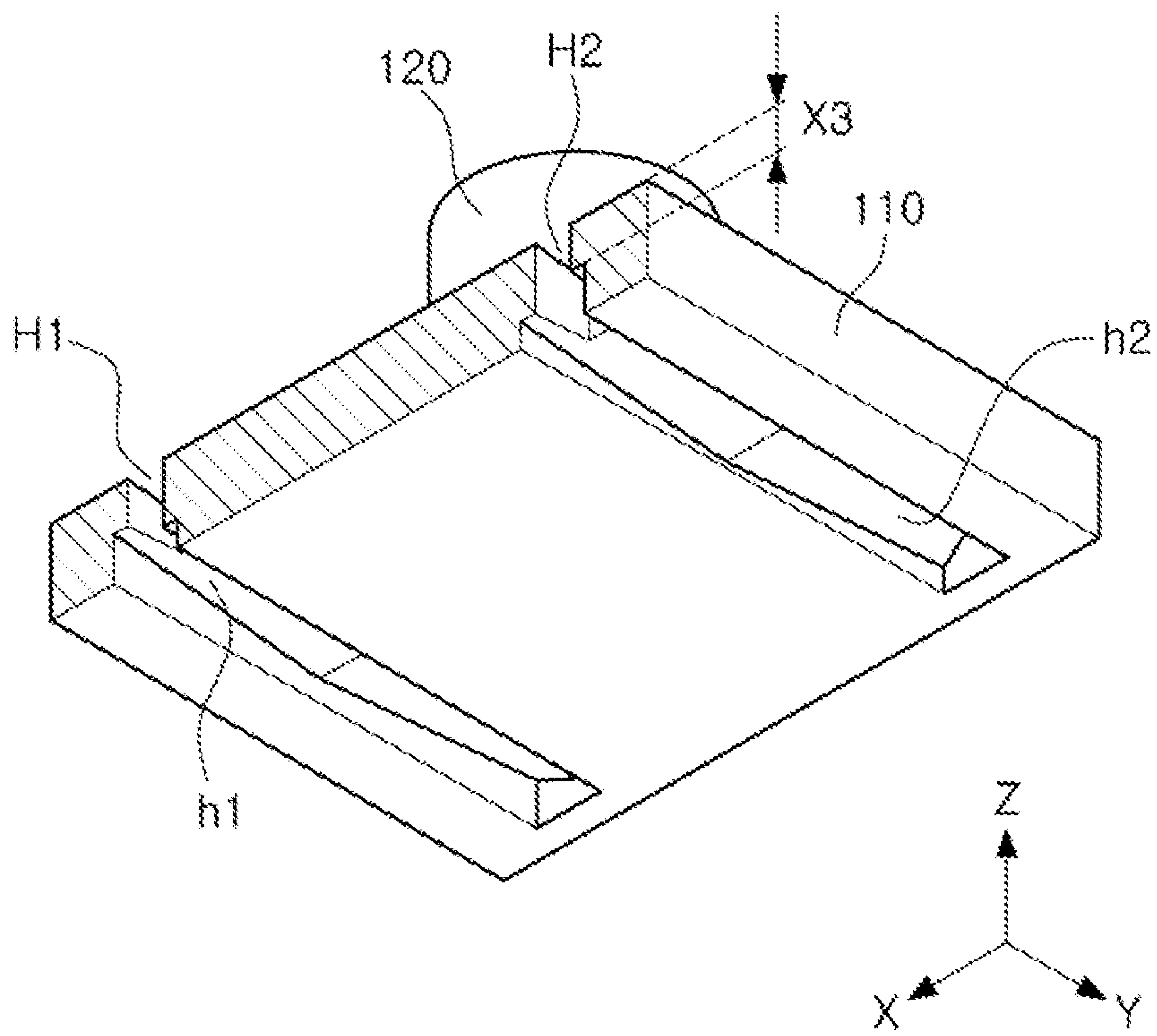

FIG. 9

COIL COMPONENT

CROSS-REFERENCE TO RELATED APPLICATION(S)

This application claims the benefit of priority to Korean Patent Application No. 10-2019-0029956 filed on Mar. 15, 2019 in the Korean Intellectual Property Office, the entire disclosure of which is incorporated herein by reference.

TECHNICAL FIELD

The present disclosure relates to a coil component.

BACKGROUND

In order to manufacture a coil component, a magnetic mold and a winding type coil may be used.

To install the coil component in a limited space, miniaturization and thinning (low-profile) are required.

In order to improve electrical characteristics of a coil component (such as allowable current and DC resistance), it is necessary to secure a wide winding area. However, a winding type coil component according to the related art has a problem in which it is difficult to secure a magnetic flux area in the entirety of the coil component by the volume occupied by the external electrode.

SUMMARY

An aspect of the present disclosure is to provide a coil component which can be lightweight, thin, short, and small, while maintaining component characteristics by securing a magnetic flux area.

According to an aspect of the present disclosure, a coil component includes a mold portion having one side and the other side opposing each other, a winding coil disposed in the other side of the mold portion, a cover portion disposed on the mold portion and the winding coil, and accommodating grooves formed in one side of the mold portion to be spaced apart from each other, and in which both ends of the winding coil are disposed, the accommodating grooves are formed to be extended from one side of the mold portion in one direction, and a distance from a bottom surface of the accommodating grooves to the other side of the mold portion increases or decreased in the one direction.

Other features and aspects will be apparent from the following detailed description, the drawings, and the claims.

BRIEF DESCRIPTION OF DRAWINGS

The above and other aspects, features, and advantages of the present disclosure will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

FIG. **1** is a schematic view of a coil component according to a first embodiment;

FIG. **2** is an exploded perspective view of FIG. **1**;

FIG. **3** is a perspective view in which a portion of a mold portion, applied to the coil component according to a first embodiment, is cut on the X-Z plane and seen from a lower direction;

FIG. **4** is a view in which a mold portion, applied to the coil component according to a first embodiment, is taken on line I-I' of FIG. **1**;

FIG. **5** is a view in which a mold portion, applied to the coil component according to a first embodiment, is taken on line II-II' of FIG. **1**;

FIG. **6** is a perspective view in which a portion of a mold portion, applied to the coil component according to a second embodiment, is cut on the X-Z plane and seen from a lower direction;

FIG. **7** is a view in which a mold portion, applied to the coil component according to a second embodiment, is taken on line I-I' of FIG. **1**;

FIG. **8** is a view in which a mold portion, applied to the coil component according to a second embodiment, is taken on line II-II' of FIG. **1**; and

FIG. **9** is a perspective view in which a portion of a mold portion, applied to the coil component according to a third embodiment, is cut on the X-Z plane and seen from a lower direction.

DETAILED DESCRIPTION

Hereinafter, embodiments of the present disclosure will be described as follows with reference to the attached drawings.

The present disclosure may, however, be exemplified in many different forms and should not be construed as being limited to the specific embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the disclosure to those skilled in the art.

Throughout the specification, it will be understood that when an element, such as a layer, region or wafer (substrate), is referred to as being "on," "connected to," or "coupled to" another element, it can be directly "on," "connected to," or "coupled to" the other element or other elements intervening therebetween may be present. In contrast, when an element is referred to as being "directly on," "directly connected to," or "directly coupled to" another element, there may be no elements or layers intervening therebetween. Like numerals refer to like elements throughout. As used herein, the term "or" includes any and all combinations of one or more of the associated listed items.

It will be apparent that though the terms first, second, third, etc. may be used herein to describe various members, components, regions, layers or sections, these members, components, regions, layers or sections should not be limited by these terms. These terms are only used to distinguish one member, component, region, layer or section from another region, layer or section. Thus, a first member, component, region, layer or section discussed below could be termed a second member, component, region, layer or section without departing from the teachings of the exemplary embodiments.

Spatially relative terms, such as "above," "upper," "below," and "lower" and the like, may be used herein for ease of description to describe one element's relationship to another element(s) as shown in the figures. It will be understood that the spatially relative terms are intended to encompass different orientations of the device in use or operation in addition to the orientation depicted in the figures. For example, if the device in the figures is turned over, elements described as "above," or "upper" other elements would then be oriented "below," or "lower" the other elements or features. Thus, the term "above" can encompass both the above and below orientations depending on a particular direction of the figures. The device may be otherwise oriented (rotated 90 degrees or at other orientations) and the spatially relative descriptors used herein may be interpreted accordingly.

The terminology used herein describes particular embodiments only, and the present disclosure is not limited thereby. As used herein, the singular forms "a," "an," and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will be further understood that the terms "comprises," or "comprising" when used in this specification, specify the presence of stated features, integers, steps, operations, members, elements, or groups thereof, but do not preclude the presence or addition of one or more other features, integers, steps, operations, members, elements, or groups thereof.

Hereinafter, embodiments of the present disclosure will be described with reference to schematic views illustrating embodiments of the present disclosure. In the drawings, for example, due to manufacturing techniques or tolerances, modifications of the shape shown may be estimated. Thus, embodiments of the present disclosure should not be construed as being limited to the particular shapes of regions shown herein, for example, to include a change in shape results in manufacturing. The following embodiments may also be constituted by one or a combination thereof.

The contents of the present disclosure described below may have a variety of configurations and propose only a required configuration herein, but are not limited thereto.

In the drawings, the X direction may be defined as a first direction or a longitudinal direction, the Y direction may be defined as a second direction or a width direction, and the Z direction may be defined as a third direction or a thickness direction.

Hereinafter, a coil component according to an embodiment will be described in detail with reference to the accompanying drawings. Referring to the accompanying drawings, the same or corresponding components are denoted by the same reference numerals, and a duplicate description thereof will be omitted.

Various types of electronic components are used in electronic devices. Here, various types of coil components may be suitably used for the purpose of noise removal or the like among these electronic components.

In other words, a coil component in an electronic device may be used as a power inductor, a high frequency (HF) inductor, a general bead, a GHz bead, a common mode filter, or the like.

First Embodiment

FIG. **1** is a schematic view of a coil component according to a first embodiment. FIG. **2** is an exploded perspective view of FIG. **1**. FIG. **3** is a perspective view in which a portion of a mold portion, applied to the coil component according to a first embodiment, is cut on the X-Z plane and seen from a lower direction. FIG. **4** is a view in which a mold portion, applied to the coil component according to a first embodiment, is taken on line I-I' of FIG. **1**. FIG. **5** is a view in which a mold portion, applied to the coil component according to a first embodiment, is taken on line II-II' of FIG. **1**.

Referring to FIGS. **1** to **5**, a coil component **1000** according to a first embodiment includes a mold portion **100**, a winding coil **300**, a cover portion **200**, and accommodating grooves h**1** and h**2**, and may further include external electrodes **400** and **500**.

A body B forms an appearance of the coil component **1000** according to an embodiment, and the winding coil **300** is embedded therein. The body B includes a mold portion **100** and a cover portion **200**. The mold portion **100** may include a core **120**.

The body B may be hexahedral as a whole.

Based on FIGS. **1** and **2**, the body B includes a first surface **101** and a second surface **102** opposing each other in a longitudinal direction X, a third surface **103** and a fourth surface **104** opposing each other in a width direction Y, as well as a fifth surface **105** and a sixth surface **106** opposing each other in a thickness direction Z. Each of the first to fourth surfaces **101**, **102**, **103**, and **104** of the body B may correspond to a wall of the body B, connecting the fifth surface **105** to the sixth surface **106** of the body B. Hereinafter, both ends of the body B refer to the first surface **101** and the second surface **102** of the body B, while both sides of the body B refer to the third surface **103** and the fourth surface **104** of the body B.

The body B may be formed to allow the coil component **1000** according to an embodiment having external electrodes **400** and **500** to be described later to have a length of 2.0 mm, a width of 1.2 mm, and a thickness of 0.65 mm, by way of example, but is not limited thereto.

Here, the body B includes a mold portion **100** and a cover portion **200**, and the cover portion **200** is disposed on an upper portion of the mold portion **100** to cover all surfaces except for a lower surface of the mold portion **100**, based on FIG. **1**. Thus, the first to fifth surfaces **101**, **102**, **103**, **104**, and **105** of the body B are formed by the cover portion **200**, while the sixth surface **106** of the body B is formed by the mold portion **100** and the cover portion **200**.

The mold portion **100** has one side and the other side opposing each other. One side of the mold portion **100** is a surface corresponding to a lower surface of the mold portion **100**, and refers to a region in which the accommodating grooves h**1** and h**2**, to be described later, are disposed. As will be described later, the accommodating grooves h**1** and h**2** are processed in the mold portion **100**, and thus bottom surfaces of the accommodating grooves h**1** and h**2** may be disposed in a region between one side and the other side of the mold portion **100**. The mold portion **100** includes a support portion **110** and a core **120**. The core **120** has a shape, passing through the winding coil **300**, and is disposed in a center portion of the other side of the support portion **110**. In this regard, in the specification, one side and the other side of the mold portion **100** are used in the same sense as one side and the other side of the support portion **110**, respectively.

The mold portion **100** may be formed by filling a mold for formation of the mold portion **100** with a magnetic material. Alternatively, the mold portion **100** may be formed by filling a mold with a composite material, containing a magnetic material and an insulating resin.

A thickness of the support portion **110** may be 200 μm or more. If the thickness of the support portion **110** is less than 200 μm, it may be difficult to secure rigidity. A thickness of the core **120** may be 150 μm or more, but is not limited thereto.

The winding coil **300** is embedded in the body B, thereby having characteristics of the coil component **1000**. For example, when the coil component **1000** according to an embodiment is used as a power inductor, the winding coil **300** may function to stabilize the power of an electronic device by storing an electric field as a magnetic field and maintaining an output voltage.

The winding coil **300** is disposed in the other side of the mold portion **100**. In detail, the winding coil **300** is wound around the core **120**, and is disposed in the other side of the support portion **110**.

The winding coil **300** is an air core coil, and may be provided as a rectangular coil. The winding coil **300** may be formed by winding a metal wire such as a copper wire, of which a surface is coated with an insulating material, in a spiral shape.

The winding coil **300** may be composed of a plurality of layers. Each layer of the winding coil **300** is formed in a flat spiral shape, and may have a plurality of number of turns. In other words, the winding coil **300** forms an innermost turn T**1**, at least one middle turn T**2**, and an outermost turn T**3**, from a center portion of one side of the mold portion **100**.

The cover portion **200** may be disposed on the mold portion **100** and the winding coil **300**. The cover portion **200** covers the mold portion **100** and the winding coil **300**. The cover portion **200** may be disposed on the support portion **110** and the core **120**, of the mold portion **100**, and the winding coil **300**, and is then pressed to be coupled to the mold portion **100**.

At least one between the mold portion **100** and the cover portion **200** includes a magnetic material. In an embodiment, both the mold portion **100** and the cover portion **200** include a magnetic material.

The magnetic material may be ferrite or magnetic metal powder.

The ferrite powder may be, for example, at least one or more among spinel type ferrite such as Mg—Zn-based, Mn—Zn-based, Mn—Mg-based, Cu—Zn-based, Mg—Mn—Sr-based, Ni—Zn-based ferrite, or the like, hexagonal ferrite such as Ba—Zn-based, Ba—Mg-based, Ba—Ni-based, Ba—Co-based, Ba—Ni—Co-based ferrite, or the like, garnet type ferrite such as Y-based ferrite, or the like, and Li-based ferrite.

The magnetic metal powder may include one or more selected from the group consisting of iron (Fe), silicon (Si), chromium (Cr), cobalt (Co), molybdenum (Mo), aluminum (Al), niobium (Nb), copper (Cu), and nickel (Ni). For example, the magnetic metal powder may be at least one or more among a pure iron powder, a Fe—Si-based alloy powder, a Fe—Si—Al-based alloy powder, a Fe—Ni-based alloy powder, a Fe—Ni—Mo-based alloy powder, a Fe—Ni—Mo—Cu-based alloy powder, a Fe—Co-based alloy powder, a Fe—Ni—Co-based alloy powder, a Fe—Cr-based alloy powder, a Fe—Cr—Si-based alloy powder, a Fe—Si—Cu—Nb-based alloy powder, a Fe—Ni—Cr-based alloy powder, and a Fe—Cr—Al-based alloy powder.

The magnetic metal powder may be amorphous or crystalline. For example, the magnetic metal powder may be a Fe—Si—B—Cr-based amorphous alloy powder, but is not limited thereto.

Each of the ferrite and the magnetic metal powder particle may have an average diameter of about 0.1 μm to 30 μm, but is not limited thereto.

Each of the mold portion **100** and the cover portion **200** may include two or more types of magnetic material. Here, the different types of magnetic materials mean that magnetic materials are distinguished from each other by any one of an average diameter, a composition, crystallinity, and a shape.

The insulating resin may include one among epoxy, polyimide, a liquid crystal polymer, or a mixture thereof, but is not limited thereto.

The first and second accommodating grooves h**1** and h**2** are formed on one side of the mold portion **100** to be spaced apart from each other, and both ends of the winding coil **300**, to be described later, are disposed in the accommodating grooves h**1** and h**2**. For example, referring to FIG. **3**, each of the accommodating grooves h**1** and h**2** is formed in one side of the mold portion **100**, and the accommodating grooves are spaced apart from each other in a longitudinal direction X. The accommodating grooves h**1** and h**2** may be disposed outside a region, corresponding to a core **120**, of a one side of the mold portion **100**.

Each of the accommodating grooves h**1** and h**2** may be formed to be extended from one side of the mold portion **100** in one direction. For example, referring to FIG. **3**, each of the accommodating grooves h**1** and h**2** is formed in one side of the mold portion **100** to be extended in a width direction Y. In an embodiment, the body B is a region including a mold portion **100** and a cover portion **200**. In this regard, one side of the body B refers to one side of a region including a mold portion **100** and a cover portion **200**. One end of the winding coil **300** is disposed in the first accommodating groove h**1**, the other end thereof is disposed in the second accommodating groove h**2**, and one end and the other end, of the winding coil, are spaced apart from each other. The first and second accommodating grooves h**1** and h**2** are regions allowing both ends of the winding coil **300** to lead out toward the external electrodes **400** and **500**, and are thus formed in one side of the body B to be spaced apart from each other to correspond to the first and second external electrodes **400** and **500**, respectively.

A distance X**1** from bottom surfaces of the accommodating grooves h**1** and h**2** to the other side of the mold portion **100** may be increased or decreased in one direction. For example, referring to FIGS. **4** and **5**, the distance X**1** from a bottom surface of each of the accommodating grooves h**1** and h**2** to the other side of the mold portion **100** increases or decreased in a width direction Y. Accordingly, thicknesses in the vicinity of a center portion of the mold portion **100** and in the vicinity of an outer side of the mold portion **100** may be different from each other.

According to an embodiment, a distance X**1** from a bottom surface of the accommodating grooves h**1** and h**2** to the other side of the mold portion **100** may be maximal in a center portion in a width direction Y of the accommodating grooves h**1** and h**2**. Due to the shapes of the accommodating grooves h**1** and h**2**, the mold portion **100** may have a convex shape based on a center portion in a width direction Y, but is not limited thereto. A distance X**1** from a bottom surface of the accommodating grooves h**1** and h**2** to the other side of the mold portion **100** may be decreased outwardly of the accommodating grooves h**1** and h**2** in the width direction Y from a center portion of the accommodating grooves h**1** and h**2** in the width direction Y. According to miniaturization of an electronic component, magnetic flux around a core may be particularly concentrated in the mold portion **100** and the cover portion **200**. According to an embodiment, as a shape of the mold portion **100** itself is deformed, as will be described later, the volume and the area, occupied by the external electrodes **400** and **500** in a component, are reduced, so a ratio of a magnetic material to a size of the same component may be increased. Moreover, an external electrode may be formed to be relatively thin, which is advantageous for reducing a thickness of a component.

As an example, the through-grooves H**1** and H**2** may be formed by a mold when the mold portion **100** is formed, and the accommodating grooves h**1** and h**2** are formed in the mold portion **100** in a process for forming the cover portion **20** by stacking and pressing a magnetic sheet, including a magnetic material. A protruding portion, corresponding to the through-grooves H**1** and H**2**, is formed in a mold for formation of the mold portion **100**, and thus the through-grooves H**1** and H**2** may be formed in the mold portion **100**, manufactured to have a form corresponding to a shape of the mold. Moreover, the accommodating grooves h**1** and h**2** are not formed in a process for forming of the mold portion **100**, but may be formed in a process for forming the cover portion **200** on the mold portion **100**. That is, through the through-grooves H**1** and H**2** of the mold portion **100**, both ends of the winding coil **300**, protruding from one side of the mold portion **100**, may be embedded inwardly of the mold portion **100** in a process for pressing the magnetic sheet. Accordingly, the accommodating grooves h**1** and h**2** may be formed in one side of the mold portion **100**. Alternatively, the accommodating grooves h**1** and h**2** as well as the through-grooves H**1** and H**2** may be formed in a process for forming the mold portion **100** using a mold. In this case, in a mold used for formation of the mold portion **100**, protruding portions, corresponding to the accommodating grooves h**1** and h**2** as well as the through-grooves H**1** and H**2**, may be formed.

Referring to FIG. **3**, both ends of the winding coil **300** may pass through one side of the mold portion **100** to be disposed in the first and second accommodating grooves h**1** and h**2**, respectively. In an embodiment, widths of the accommodating grooves h**1** and h**2** are illustrated as being greater than widths of the through-grooves H**1** and H**2**. However, a form, in which ends of the winding coil **300** are disposed in the accommodating grooves h**1** and h**2**, is not limited. Thus, the widths of the accommodating grooves h**1** and h**2** may be equal to the widths of the through-grooves H**1** and H**2**.

Both ends of the winding coil **300** are exposed to one side of the mold portion **100**, that is, the sixth surface **106** of the body B. Both ends of the winding coil **300**, exposed to one side of the mold portion **100**, are disposed in the accommodating grooves h**1** and h**2** formed in the sixth surface **106** of the body B to be spaced apart from each other.

Referring to FIGS. **2** and **3**, both ends of the winding coil **300** pass through the support portion **110** of the mold portion **100** to be exposed to one side of the support portion **110**. In detail, although not illustrated, both ends of the winding coil **300** are equal to a thickness of the winding coil **300**, and thus have a form protruding from one side of the support portion **110** by the thickness of the winding coil **300**. However, in a process for polishing an opening of a plating resist for formation of the external electrodes **400** and **500**, to be described later, the protruding end may be polished together. In this case, ends of the winding coil **300**, exposed to one side of the support portion **110**, may be substantially smaller than a thickness of the winding coil **300**.

The external electrodes **400** and **500** may be spaced apart from each other in one side of the body B, that is, the sixth surface **106**. In detail, the external electrodes may be spaced apart from each other on one side of the mold portion **100**, and may be connected to both ends of the winding coil **300**, respectively.

On a surface of each of the first and second external electrodes **400** and **500**, a concave portion may be disposed in a region corresponding to a center portion of each of the accommodating grooves h**1** and h**2**. That is, both ends of the winding coil **300** are disposed along bottom surfaces of the accommodating grooves h**1** and h**2**, and the external electrodes **400** and **500** are applied along both ends of the winding coil **300**. Thus, the external electrodes may be formed to correspond to forms of the accommodating grooves h**1** and h**2**. In this regard, when a distance X**1** from a bottom surface of the accommodating grooves h**1** and h**2** to the other side of the mold portion **100** is maximal in a center portion of the accommodating grooves h**1** and h**2**, or decreases outwardly of the accommodating grooves h**1** and h**2** from a center portion of the accommodating grooves h**1** and h**2**, the external electrodes **400** and **500** may be disposed concavely in a region corresponding to the center portion of the accommodating grooves h**1** and h**2**. As an example, when a conductive resin, including conductive powder such as silver (Ag) is applied to the accommodating grooves h**1** and h**2** to form the external electrodes **400** and **500**, due to the above-described shape of the accommodating grooves h**1** and h**2**, the thus formed shape of an exposed surface of both ends of the winding coil **300**, and surface tension of a conductive resin, the concave portion, described above, may be formed in the external electrodes **400** and **500**. Compared with a winding type coil component according to the related art, in which an exposed surface of a winding coil **300** is flat, in an embodiment, concave portions are formed in the external electrodes **400** and **500**, so an area and a volume of the external electrodes **400** and **500** may be reduced.

The external electrodes **400** and **500** may include a conductive material such as copper (Cu), aluminum (Al), silver (Ag), tin (Sn), gold (Au), nickel (Ni), lead (Pb), chromium (Cr), titanium (Ti), or alloys thereof, but are not limited thereto,

The external electrodes **400** and **500** may be formed as a single layer or a plurality of layers. According to an embodiment, the external electrodes **400** and **500** may include a first layer, in contact with and connected to both ends of the winding coil **300**, and a second layer covering the first layer. As an example, the first layer may be formed of a conductive resin including silver (Ag) powder, but is not limited thereto. Alternatively, the first layer may be formed by a line plating layer including copper (Cu). In detail, although not illustrated, the second layer may be disposed on the first layer to cover the first layer. The second layer may include nickel (Ni) or tin (Sn). The second layer may be formed by electrolytic plating, but is not limited thereto.

Meanwhile, the coil component **1000** according to an embodiment may further include an insulating layer **130** surrounding a surface of the winding coil **300**. A method for forming the insulating layer **130** is not limited. For example, the insulating layer may be formed by chemically vapor-depositing a parylene resin or the like on a surface of the winding coil **300**, or may be formed using a known method such as a screen printing, exposure of photo resist (PR), a process through development, spray application, a dipping process, or the like.

The insulating layer **130** is not particularly limited as long as it could be formed as a thin film. For example, the insulating layer may be formed using photo resist (PR), an epoxy resin, or the like.

Meanwhile, although not illustrated, the coil component **1000** according to an embodiment may further include an additional insulating layer in a region of the sixth surface **106** of the body B, except for a region in which the external electrodes **400** and **500** are disposed. The additional insulating layer may be used as a plating resist in forming the external electrodes **400** and **500** by electrolytic plating, but is not limited thereto. In addition, the additional insulating layer is disposed in at least a portion of the first to fifth surfaces **101**, **102**, **103**, **104**, and **105** of the body B, and may prevent electrical shorts between other electronic components and the external electrodes **400** and **500**.

Meanwhile, in FIGS. **1** to **5**, it is illustrated in that the through-grooves H**1** and H**2** pass through the mold portion **100** inside the mold portion **100**, but this is merely exemplary. In other words, as a modification of an embodiment, the through-grooves H1 and H2 are formed in side surfaces of the mold portion **100** and may be connected to the accommodating grooves h**1** and h**2**, disposed on one side of the mold portion **100**. In this case, both ends of the winding coil **300** may be disposed along a side surface of the mold portion **100** and one side of the mold portion **100**.

Second Embodiment

FIG. **6** is a perspective view in which a portion of a mold portion, applied to the coil component according to a second embodiment, is cut on the X-Z plane and seen from a lower direction. FIG. **7** is a view in which a mold portion, applied to the coil component according to a second embodiment, is taken on line I-I' of FIG. **1**. FIG. **8** is a view in which a mold portion, applied to the coil component according to a second embodiment, is taken on line II-II' of FIG. **1**.

Referring to FIGS. **6** to **8**, compared with the coil component **1000** according to a first embodiment, a coil component according to a second embodiment includes accommodating grooves h**1** and h**2** as well as external electrodes **400** and **500** with different shapes. Thus, in the description of an embodiment, only the accommodating grooves h**1** and h**2** as well as the external electrodes **400** and **500** will be described, which are different from those in a first embodiment. The description of a first embodiment may be applied to other configurations of an embodiment as it is.

Referring to FIGS. **6** to **8**, the accommodating grooves h**1** and h**2**, applied to an embodiment, may be formed to allow a distance X**2** from a bottom surface of the accommodating grooves h**1** and h**2** to the other side of the mold portion **100** to be minimal in a center portion in a width direction Y. The distance X**2** from a bottom surface of the accommodating grooves h**1** and h**2** to the other side of the mold portion **100** may be increased outwardly of the accommodating grooves h**1** and h**2** in the width direction Y from a center portion in the width direction Y. Due to the shapes of the accommodating grooves h**1** and h**2**, the mold portion **100** may have a concave shape based on a center portion in a width direction Y, but is not limited thereto. According to miniaturization of an electronic component, magnetic flux around a core **120** may be particularly concentrated in the mold portion **100** and the cover portion **200**. According to a second embodiment, as a shape of the mold portion **100** itself is deformed, the volume and the area, occupied by the external electrodes **400** and **500** in a component, are reduced, so a ratio of a magnetic material to a size of the same component may be increased.

Moreover, an external electrode may be formed to be relatively thin, which is advantageous for reducing a thickness of a component.

In a second embodiment, ends of the winding coil **300** are disposed along bottom surfaces of the accommodating grooves h**1** and h**2**, and the external electrodes **400** and **500** are applied along the ends of the winding coil **300**. Thus, the external electrodes **400** and **500** may be formed to correspond to forms of the accommodating grooves h**1** and h**2**. Referring to FIGS. **7** and **8**, the external electrodes **400** and **500** are disposed in the accommodating grooves h**1** and h**2**, processed to be concave inwardly of the mold portion **100**, thereby reducing areas of the external electrodes **400** and **500**, protruding outwardly of the body B. Compared with a winding type coil component according to the related art, in which an exposed surface of a winding coil **300** is flat, the external electrodes **400** and **500** are disposed inwardly of the mold portion **100**, so an area and a volume of the external electrodes **400** and **500** may be reduced in the entirety of a coil component.

Third Embodiment

FIG. **9** is a perspective view in which a portion of a mold portion, applied to the coil component according to a third embodiment, is cut on the X-Z plane and seen from a lower direction.

Referring to FIG. **9**, compared with the coil component according to first and second embodiments, in a coil component according to a third embodiment, a distance X**3** from bottom surfaces of accommodating grooves h**1** and h**2** to the other side of the mold portion **100** increases or decreased in a different direction. Thus, in the description of an embodiment, a direction, in which the distance X**3** from bottom surfaces of accommodating grooves h**1** and h**2** to the other side of the mold portion **100** increases or decreased, will be only described, which is different from those in first and second embodiments. The description of first and second embodiments may be applied to other configurations of an embodiment as it is.

In a third embodiment, the distance X**3** from a bottom surface of the accommodating grooves h**1** and h**2** to the other side of the mold portion **100** increases or decreased in the other direction, perpendicular to one direction. That is, for example, the distance X**3** from bottom surfaces of the accommodating grooves h**1** and h**2** to the other side of the mold portion **100** may be increased or decreased in a longitudinal direction X, perpendicular to a width direction Y. Accordingly, in the longitudinal direction X, thicknesses in the vicinity of a center portion of the mold portion **100** and in the vicinity of an outer side of the mold portion **100** may be different from each other.

As an example, the distance X**3** from bottom surfaces of the accommodating grooves h**1** and h**2** to the other side of the mold portion **100** may be maximal in a region adjacent to a center portion of the mold portion **100** in a longitudinal direction X. The distance X**3** from bottom surfaces of the accommodating grooves h**1** and h**2** to the other side of the mold portion **100** may be reduced from an interior of the accommodating grooves h**1** and h**2** in the longitudinal direction X to an exterior of the accommodating grooves h**1** and h**2** in the longitudinal direction X. According to miniaturization of an electronic component, magnetic flux around a core may be particularly concentrated in the mold portion **100** and the cover portion **200**. According to a third embodiment, as a shape of the mold portion **100** itself is deformed, the volume and the area, occupied by the external electrodes **400** and **500** in a component, are reduced, so a ratio of a magnetic material to a size of the same component may be increased.

Moreover, an external electrode may be formed to be relatively thin, which is advantageous for reducing a thickness of a component.

As set forth above, according to an embodiment in the present disclosure, a coil component may be lightweight, thin, short, and small, and may maintain component characteristics by securing a magnetic flux area.

While exemplary embodiments have been shown and described above, it will be apparent to those skilled in the art that modifications and variations could be made without departing from the scope of the present invention as defined by the appended claims.

What is claimed is:

1. A coil component, comprising: a mold portion having a first surface and a second surface opposing each other in a thickness direction;

a winding coil disposed on the second surface of the mold portion;

a cover portion disposed on the mold portion and the winding coil; and

accommodating grooves disposed on the first surface of the mold portion and spaced apart from each other in a longitudinal direction of the coil component perpendicular to the thickness direction, both ends of the winding coil being disposed in the accommodating grooves, respectively,

wherein an accommodating groove of the accommodating grooves extends from one side of the mold portion in a width direction perpendicular to the thickness and longitudinal directions, and

the accommodating groove includes inclined surfaces, angled with respect to the width direction, extending from one end to the other end of the accommodating groove, such that a minimum distance from the accommodating groove to the second surface of the mold portion, in the thickness direction of the molded portion and the winding coil, increases in the width direction.

2. The coil component of claim 1, wherein the minimum distance from the accommodating groove to the second surface of the mold portion decreases from a center portion of the accommodating grooves outwardly of the accommodating groove.

3. The coil component of claim 1, wherein the minimum distance from the accommodating groove to the second surface of the mold portion is minimal in a center portion of the accommodating groove.

4. The coil component of claim 1, wherein the minimum distance from the accommodating groove to the second surface of the mold portion increases from a center portion of the accommodating groove outwardly of the accommodating groove.

5. The coil component of claim 1, wherein the minimum distance from the accommodating groove to the second surface of the mold portion increases or decreases in the longitudinal direction perpendicular to the width direction.

6. The coil component of claim 1, wherein the molded portion includes a core around which the winding coil is wound,

the winding coil has an innermost turn adjacent to the core, at least one middle turn, and an outermost turn, and

a width and a thickness of the innermost turn are equal to a width and a thickness of the outermost turn, respectively.

7. The coil component of claim 1, wherein each of both ends of the winding coil pass through the mold portion.

8. The coil component of claim 1, wherein the winding coil includes at least two stacks of coil turns in a thickness direction of the molded portion in parallel to a direction connecting the first and second surfaces of the molded portion.

9. The coil component of claim 1, wherein each of the first and second accommodation grooves is exposed to one side surface of the molded portion.

10. The coil component of claim 1, further comprising:

first and second external electrodes disposed in the accommodating grooves to be respectively connected to the both ends of the winding coil,

wherein the first or second external electrode has a convex shape, and

a thickness of the first or second external electrode, immediately below a portion of the accommodating groove having a largest thickness in the thickness direction, is greater than a thickness of the first or second external electrode, immediately below a portion of the accommodating groove having a smallest thickness in the thickness direction.

11. The coil component of claim 1, wherein the both end portions of the winding coil bend toward the first surface in a direction connecting the first and second surfaces of the molded portion, and penetrating through the accommodating grooves, respectively.

12. The coil component of claim 11, wherein the both end portions of the winding coil further bend toward one side surface of the molded portion in the width direction, and extend onto the accommodating grooves in the width direction.

13. The coil component of claim 1, wherein the minimum distance from the accommodating groove to the second surface of the mold portion is maximal in a center portion of the accommodating groove.

14. The coil component of claim 13, further comprising:

first and second external electrodes disposed in the accommodating grooves to be respectively connected to the both ends of the winding coil,

wherein a concave portion is disposed in a region corresponding to the center portion of the accommodating groove, in each of the first and second external electrodes.

15. The coil component of claim 14, further comprising an insulating layer surrounding a surface of the winding coil,

wherein the insulating layer is disposed on the surface of the winding coil, except for regions in which the first and second external electrodes are disposed.

16. The coil component of claim 14, wherein each of the first and second external electrodes includes a first layer in contact with and connected to the both ends of the winding coil, and a second layer covering the first layer.

17. The coil component of claim 16, wherein the first layer includes silver (Ag), and the second layer includes nickel (Ni) or tin (Sn).

18. The coil component of claim 16, wherein the first layer includes a conductive resin layer.

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